

CLAIMS

1. Steam generator comprising an outer jacket (2) of generally cylindrical shape arranged with its vertical axis having a lower cylindrical part (2a) containing a bundle (3) of heat exchange tubes connected to a primary fluid circuit and arranged in a bundle wrapper (4) which is substantially coaxial with the outer jacket (2), an upper cylindrical part (2b) having a diameter greater than the diameter of the lower part (2a) in particular containing separators and steam dryers (15) and a part (2c) with a frustoconical junction between the lower part (2a) and the upper part (2b) of the outer jacket (2), at least a first and a second device (8, 16) for supplying feed water to an annular space (7) between the bundle wrapper (4) and one of a guide skirt (13) and the outer jacket (2), via the upper part of the annular space (7) which communicates with the inner space of the bundle wrapper (4) at its lower part, each one comprising a feed water distribution header (10, 17) in the annular space (7) arranged inside the outer jacket (2) having a toroidal wall substantially coaxial with the outer jacket (2) and with the bundle wrapper (4), the toroidal wall being penetrated by a plurality of openings for the passage of water into its upper part and at least one feed water supply pipe (9, 19) in a space inside the toroidal wall of the header (10, 17) penetrating the outer wall (2) of the steam generator (1), the first feed device (8) being used during normal operation of the steam generator (1) and the second feed device (16) being used in order to feed the steam generator (1) with emergency water, characterized in that the second toroidal header (17) of the second emergency feed water device (16) placed inside the upper part (2b) of the outer jacket (2) comprises, fastened to each of its openings (21) for the passage of water from its toroidal wall, a tube (22) for injecting water having an open lower end part (22a) fastened to the opening

(21) of the toroidal wall, a straight part (22b) which is inclined with respect to the vertical axial direction in the direction of a central part of the steam generator (1) and an upper end open at the end of 5 the straight part (22b) of the tube (22) for injecting emergency water inside the steam generator (1).

2. Steam generator according to Claim 1, characterized in that the inclined straight part (22b) 10 of each of the water injection tubes (22) makes an angle ( $\alpha$ ) of between about  $5^\circ$  and about  $20^\circ$  and preferably an angle ( $\alpha$ ) of roughly  $10^\circ$  with the vertical axial direction.

15 3. Steam generator according to Claim 1, characterized in that the openings (21) penetrating the wall of the second toroidal header (17) of the second emergency feed water device (16) are circular openings centred on a circle parallel to the toroidal header 20 (17) located close to the uppermost part of the wall of the toroidal header and that each of the emergency water injection tubes (22) comprises a first portion (22a) and a second portion (22b), the axes of which make a non-zero angle ( $\alpha$ ) between them, each of the 25 emergency water injection tubes (22) being fastened by one end of its first portion (22a) to an opening (21) penetrating the wall of the second toroidal header (17).

30 4. Steam generator according to Claim 1, characterized in that each of the emergency water injection tubes (22) in the steam generator comprises at least one support means (23) such as a cleat for fastening the water injection tube (22) by welding to 35 the outer surface of the second toroidal header (17).

5. Steam generator according to Claim 1, characterized in that each of the water injection tubes (22) comprises, in its lower end part fastened to the

opening (21) of the second toroidal header (17), a device for trapping debris (30).

6. Steam generator according to Claim 5,  
5 characterized in that the debris trapping device (30)  
consists of a circular plate having a diameter  
substantially equal to the inside diameter of the tube  
(22) and penetrated by openings having a dimension less  
than a characteristic dimension of the debris which it  
10 is desired to trap.

7. Steam generator according to any one of Claims 1  
to 6, characterized in that the feed water supply pipe  
(19) connected to the second header (17) by means of a  
15 first end comprises a second opposite end connected,  
for example by welding, to a pipe (18) penetrating the  
wall (2b) of the upper part of the steam generator.

8. Steam generator according to Claim 7,  
20 characterized in that the second toroidal header (17)  
of the second emergency feed water device (16) is  
supported, inside the upper part (2b) of the outer  
jacket of the steam generator, by at least three  
25 brackets (26) fastened in radial arrangements over the  
inner surface of the upper part (2b) of the outer wall  
(2) of the steam generator, by a first end and  
comprising a second end directed towards the central  
part of the outer jacket of the steam generator  
comprising a recess (27) which is open in the direction  
30 of the central part of the outer jacket (2) of the  
steam generator, a first arm (26a) defining a lower  
part of the recess (27) and a second arm (26b) defining  
an upper part of the recess (27), a cavity (28) being  
made in an inner face of the lower arm (26b) in order  
35 to accommodate a wedge (29) for supporting the second  
toroidal header (27) with a clearance in the vertical  
direction and in the radial horizontal direction of  
each of the support brackets (26).